

REMARKS

Claims 1-15 are pending in this application. By this Amendment, claims 1, 3, 6, 8, 11, and 13 have been amended. The specification has been amended in response to the objection to the drawings on page 2 of the Office Action. The amendment to the specification in paragraph [0046] corresponds to the published Application paragraph [0062] and the amendment to paragraph [0061] corresponds to the published Application paragraph [0077] as identified in paragraph 1, on page 2 of the Office Action. It is noted that paragraph [0046] as originally filed identified the figure as Fig. 7B. It is not clear how the published application in paragraph [0077], changed the figure number from Fig. 7B to Fig. 7E. However, to show an amendment, Applicants have amended Fig. 7B to read Fig. 7B. The amendment to paragraph [0061] changes reference number 20 to reference number 120 and reference number 102 to reference number 102a in agreement with Fig. 12. Accordingly, it is respectfully requested that the objection to the drawings be withdrawn. No new matter has been added. Further, formal replacement sheets are provided for Figs. 1-12.

In paragraph 3, on page 2 of the Office Action, claims 1, 3, 5, 6, 8, 10, 11, 13 and 15 were rejected under 35 U.S.C. §102(b) over Takahashi, U.S. Patent No. 6,099,103. The rejection is respectfully traversed.

Takahashi fails to disclose, teach or suggest that the voltage pulse supplied to the actuator changes a state of the actuator from the first state to the second state and then to the first state again so that two separate ink droplets consisting of a main droplet and a satellite droplet smaller than the main droplet are successfully ejected through the nozzle, "Tw" is a pulse width of the voltage pulse during the second state, and the two separate ink droplets are ejected whenever the state of the actuator is changed from the second state to the first state, as recited in claims 1, 3, 6, 8, 11, and 13.

In Takahashi, a main driving waveform for the ejection of ink droplets is followed by two additional non-jet pulses (Abstract). Takahashi also describes that "the application of a jet pulse signal A of one dot is followed by the application of both a droplet downsizing pulse B as a non-jet pulse for reducing the size of an ejected ink droplet, the pulse B being smaller in pulse width than the jet pulse signal A, and a jet stabilizing pulse C as a non-jet pulse for stabilizing the ejection of the ink droplet" (Abstract; Fig. 2). As Takahashi describes, the additional pulse signal B is a non-jet pulse signal applied additionally and subsequent to the jet pulse signal A at a timing capable of pulling back a part of an ink droplet, which has rushed out from the nozzle in accordance with the jet pulse signal A (col. 7, lines 17-21). Both signals A and B are the same in peak value (voltage value), for example, 20V (col. 7, lines 20-22). Accordingly, when two separate ink droplets are ejected, the two separate ink droplets of Takahashi are not ejected whenever the state of the actuator is changed from the second state to the first state.

As shown in Fig. 2 of Takahashi, the driving waveform includes the same jet pulse signal A and first additional pulse signal B, i.e., droplet downsizing pulse, as well as a second additional pulse signal C, i.e., jet stabilizing pulse, which is a non-jet pulse for stabilizing the ejection of ink (col. 7, lines 46-52).

In other words, Takahashi uses a complicated pulse waveform, i.e., a combination of an ejection pulse and an additional pulse, so that a driving waveform is applied to an electrode 619 disposed in the ink chamber 613 (Figs. 8A-8B). Thus, Takahashi uses a combination of an ejection pulse and an additional pulse as a means to eject two ink droplets, i.e., two separate large and small ink droplets, successively through the nozzle.

Applicants' ink jet printing apparatus, on the other hand, successively ejects two large and small ink droplets through a nozzle utilizing a single rectangular pulse (Fig. 8C; paragraph [0043]). As a result, for example, the pressure is applied to the ink in the pressure chamber and thereby two separate large and small ink droplets are ejected through the ink ejection port at the

tip of the corresponding nozzle (paragraph [0043]). Thus, the ink droplets will reach the print face of a print paper to form dots (paragraph [0043]). Takahashi fails to disclose these features.

Applicants describe a similar structure to Takahashi, where the pulse waveform is relatively complicated because two different pulses of the ejection and additional pulses are supplied to the actuator to eject two of large and small ink droplets successively in that order, (paragraph [0004]). As Applicants describe, the more complicated the pulse waveform is, the larger the occupation time of a series of the pulse train required for ejecting a series of ink droplets (paragraph [0004]). Accordingly, this type of structure makes it difficult to achieve a high speed printing (paragraph [0004]). Applicants address this problem. Takahashi does not.

One of the advantages of the embodiment described by the Applicants, for example, is that due to the relatively simple waveform of the pulse that drives the actuator, the room can be increased for improving the print quality by, e.g., canceling the pressure wave remaining within the ink passage (paragraph [0009]). Takahashi fails to achieve this advantage because Takahashi uses at least two pulses having a complicated waveform to drive the actuator in order to successively ejected through the nozzle the two large and small ink droplets.

Accordingly, Takahashi does not literally disclose each and every feature of Applicants' claimed invention as recited in claims 1, 3, 6, 8, 11, and 13 and the rejection under 35 U.S.C. §102 is inappropriate. Further, for the reasons discussed, Takahashi does not suggest the features as recited in claims 1, 3, 6, 8, 11, and 13.

Because Takahashi does not anticipate or suggest the features of claims 3, 8, and 13, Takahashi cannot possibly anticipate or suggest the subject matter of claim 5, which depends from claim 3; the subject matter of claim 10, which depends from claim 8; and the subject matter of claim 15, which depends from claim 13, for the reasons discussed with respect to claims 3, 8, and 13 and for the additional features recited therein. It is respectfully requested that the rejection be withdrawn.

In paragraph 4, page 7 of the Office Action, claims 2, 7, and 12 were rejected under 35 U.S.C. §103(a) over Takahashi. The rejection is respectfully traversed.

Takahashi fails to overcome its own differences as applied to claims 1, 6, and 11 for at least the reasons discussed above.

Because Takahashi does not disclose or suggest all the features recited in claims 1, 6, and 11, Takahashi cannot possibly render obvious the subject matter of claims 2, 7, and 12 for that reason and for the additional features recited. It is respectfully requested that the rejection be withdrawn.

In paragraph 4, on page 8 of the Office Action, claims 4, 9, and 14 were rejected under 35 U.S.C. §103(a) over Takahashi. The rejection is respectfully traversed.

Takahashi fails to overcome its own deficiencies as applied to claims 3, 8, and 13 for at least the reasons discussed above.

Because Takahashi does not disclose or suggest all the features recited in claims 3, 8, and 13, Takahashi cannot possibly render obvious the subject matter of claims 4, 9, and 14 for that reason and for the additional features recited. It is respectfully requested that the rejection be withdrawn.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-15 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Amendments to the Drawings:

The attached replacement sheets provide formal drawings for Figs. 1-12.

Attachment: Replacement Sheets (12)